

July 1985

# TWIN CITIES ATARI INTEREST GROUP

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NEWSLETTER EDITORS: DAVE STENGEL & CORY JOHNSON

**THE TAIG MONTHLY REPRINT ISSUE!**  
The BEST from everyone ELSE'S newsletters.

**TAIG**

Twin Cities Atari Intrest Group  
684 Queen Avenue South  
Richfield, MN. 55423

Next TAIG meeting:  
Sunday, July 28, 1985  
SWAP meet.....5:00 p.m.  
TAIG.....7:00 p.m.  
at  
St. Louis Park Rec. Center  
5005 West 36th Street  
St. Louis Park, MN.

Next NAGS Meeting:  
Wednesday, August 21, 1985  
NAGS.....6:30 p.m.  
at  
User Friendly Computers,  
8465 Plaza Blvd.  
Spring Lake Park, MN.



### Notes from the President Dick Johnson

"The rain of King Seifert the 1st is over and the Dictatorship of Johnson the Terrible has begun." That how I had planned to start my 1st column as president, as it looked as if we were going to have another election with only one candidate for each office. But a wonderful thing happened along the way, we actually had a race. The candidates were for President: Richard Johnson & Keith Marshall. For Vice President: Jim Glich & Phil Seifert. For Treasure: Henry Katzmarek, Virginia Keith, & Phillis Landsman. And for Secretary: Dave Stengel. The underlined were the winners.

I'd like to thank each and everyone of the candidate and I hope this is an example of renewed interest in the user group. I would especially like to thank Dave Stengel who is now our Secretary, Co-editor of the Newsletter, and Assistant Sysop on the BBS.

As President, I plan to try to redirect the user group (not club) back to a place where you come to exchange ideas and information, a place to come too for help in solving problems, and seeing demo's of the latest new software. Although the New Atari ST's are exciting, less emphases will be placed on them until they have become more dominate in the computer community. This is not to say we will ignore the ST, in fact I plan to start a ST special interest group to start at 6 PM before the regular meeting and demo's for the ST after the regular 8 bit machine demo's for those who are interested. But since most of us own an 800 or other 8 bit machine we will try to direct most of our attention there.

We are also reinstituting the Random Access Notes. Written questions submitted prior to the meeting. These questions will be answered during the meeting and the

best questions and answers will be published in the next newsletter.

These are some of my ideas, but your's are the voices that count. Let us know what changes you would like to see, either my phone, letter, conversation, E-Mail, newsletter article, or smoke signals.

Thants it for now see you at the meeting.

.....FLASH.....

Henry Katzmarek has just received his Atari 520ST and it will be at the next TAIG meeting July 28th. We'll see how much Henry can come up with with only a week to prepare.

Local ATARI BBS's  
(612 Area Code)

Inner Circle.....483-2660  
Legion of Doom.....473-1623  
A Man's Hideout.....544-8156  
TAIG/SPACE BBS.....544-9058  
The Atari Barn.....521-5398  
The Firm.....776-7841

### !! NOTICE !!

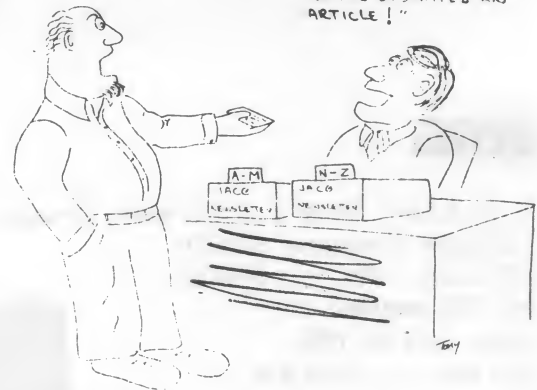
As of Thursday, August 1, the TAIG/SPACE BBS will be moving from its present location at Wizards Work. The NEW phone number will be (612) 473-2897

This will allow the sysops to keep a constant watch on the system, and speed password validation, etc.

Reprinted from JACB,  
Jersey Atari Computer Group

"WHAT'S THIS, YOUR CARD?"

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- Atari Software

—Repair Service Offered—

1030 Ring Detect  
reprinted from Computer Squad News  
March 1985

If you've ever thought about running a BBS on a 1030 modem, here is some information you may need to know. There are only 4 parts required to build a ring detector: 1) A phone wire to connect to your phone line, plug-in type is best. 2) A joystick replacement cable. 3) A 125 volt AC relay. Radio Shack #275-217B or equivalent. 4) A 22 MF or greater capacitor of at least 100 volts. 5) An optional plastic box. DO NOT USE METAL.

Connect the Green Phone Wire to pin 7 of the relay coil.

Connect the + (positive) end of the 20MF capacitor to pin 8 of the relay coil.

Connect the Red Phone Wire to the - (negative) end of the capacitor.

Connect the unit to the phone line and test to see that it responds. REMOVE IT FROM THE PHONE LINE!!

Connect the Orange joystick wire to the Common Relay Contact pin 4.

Connect the Black joystick wire to the N.O. Relay Contact pin 6.

With a meter or circuit tester, check that no connection between the phone wires and joystick wires have occurs. Cross check all 4 wires.

Package up, to protect the unit and install it in Joyatick port 2.

Plug the unit into the phone jack. You may need a Y telephone adapter jack.

You are now ready to run your software.

04:05 OK>Evaluation

AN EVALUATION OF THE 130XE

by Thomas Warren

I'm writing this on a new 130XE, just wishing everyone could get their hands on this computer.

The Ramdisk is everything you've heard about it and more. I saved and loaded a 157 sector BASIC file in less than 10 seconds! You heard right! Now I have an understanding about the speed of a hard drive. The 1050 is still the same speed, but for programming you can't beat

the Ramdisk. Going to DOS is equally as fast, as DUP.SYS resides in the Ramdisk. Type DOS and you're there in the blink of an eye.

Loading the Ramdisk is easy, just boot a disk having the file RAMDISK.COM, and it will be loaded in a few seconds. Haven't tried it with an AUTORUN.SYS file yet.

The case is light grey, sleek and stylish. It doesn't have a thin plastic shell like the Commodore 64. This is a strong, well built machine. The keyboard is standard Atari, but with control characters imprinted on the front of the keys. The 800XL function keys are just above the CLEAR, INSERT, and DELETE keys. The HELP key has been kept.

OVERVIEW:

Size: 13 5/8"L 2 7/16"H 9 3/16"D

Rear: PORTS: CARTRIDGE, EXPANSION  
Plugs: Monitor, Channel select,  
Television plug, Power (DIN),  
On/Off switch

Joysticks: 2 on right side

The keys are large like the older 800, with a downward slant. The feel is soft, not unlike the older Apple II's, and take some getting used to, but then again, I'm used to the stiffness of the 800.

A word about the manual: it's great! No more short booklets. You get a 132 page instruction book starting with beginners, and going up to hardware tech specs. Like the computer, it's sharp and classy. Everything is highly legible, and

hooking up is a snap with the detailed pictures. Somebody took their time with this.

If the XE has any flaws, it has to be this: the keyboard is just too soft, you don't get a sure response when pressing a key. It will take time getting used to it. They could have made the action a little more responsive. I hate to say this about an Atari, but the keyboard response resembles that of a Commodore 64. I mean, you're just not sure of making contact when you press a key.

How would I rate it? Aside from the keyboard, I would say this is going to be THE 8-bit computer after seeing the RAMDISK. For \$149.95, you just can't beat the power and ease of use. Move over Commodore and Apple -- Atari's back!

Now if I can just convince the powers that be, that I really need this computer!

Ed note: Thomas Warren is the treasurer for TACO, the Tuscon Atari Computer Organization, and is also the sysop for the TACO BBS, Zandor. Zandor is now running FastAMIS on a 130XE, utilizing the RAM disk. Zandor 602-326-1186.

Disabling 800XL BASIC

by Dave Webster

reprinted from Atari Bay Area  
Computer Users Society  
October, 1984

This article was written for those people who own diskettes that boot binary files with an AUTORUN.SYS menu loader. I will describe how to boot without holding the option button.

The XL series enables and disables BASIC at address HEX \$D301, DECIMAL 54017. 400/800's usually use this address for the input of joysticks on ports #3 and #4.

(omitted on the XL) The XL series uses this address for a variety of configurations. For example, bit 0 at HEX \$D301 says that the operating system ROM is active or you are using RAM below it. Bit 1 says BASIC is enabled or disabled. One of the other bits at this address is used to tell if the diagnostic ROM is enabled or disabled. The normal values for \$D301 are \$FF (BASIC disabled), \$FD (BASIC enabled). All we have to do is add some instructions to the loader program to access RAM and not BASIC. Thus, ridding you of the bother of holding down the OPTION key to disable BASIC. If you're familiar with machine code you might try adding something like the following: LDA #\$FF, STA \$D301. Since Atari load files can have multiple segments (each one having its own start and end address) and all files start with two \$FF bytes, you could specify that a file starts at \$D301 and ends at \$D301, and consists of only one byte, \$FF. This would put an \$FF byte at \$D301, enabling RAM and disabling BASIC.

However, there is an easier way to do the same thing. The following steps will tell you how:

#### FOR ATARI DOS 2.0S:

1. Boot DOS while holding the OPTION button.
2. Put a diskette, containing the AUTORUN.SYS loader in the drive.
3. Hit the "E" option to rename the loader: AUTORUN.SYS, AUTORUN.OLD
4. Hit the "k" option to binary save AUTORUN.SYS at a starting address of D301 and ending address of D301. Type it like this: AUTORUN.SYS, D301, D301
5. Now lastly, hit the "c" option to copy a file. This will be used to append AUTORUN.OLD to the just save AUTORUN.SYS file, like this: AUTORUN.OLD, AUTORUN.SYS/A

#### FOR OS/A+ or DOS XL:

1. Boot DOS while holding down the OPTION button. If you see the DOS XL menu, hit the "Q" option.
2. Put a diskette containing the AUTORUN.SYS loader in the drive.
3. Type this command: RENAME AUTORUN.SYS AUTORUN.OLD
4. Type this command: SAVE AUTORUN.SYS D301 D301
5. Type this command: COPY -AF AUTORUN.OLD AUTORUN.SYS

You can now use this loader with any disk that has binary files on it! It will boot correctly without holding the option button down.

Atariwriter Underground: II Phon  
Lines and Block Moves  
by Frank Pazel  
reprinted from JACS Newsletter,  
November 1984

The Atariwriter ROM has, in addition to the ability to do a for of mail merge discussed in last month's newsletter, the mechanism to transfer files via a modem.

In order to use this hidden modem handler you must boot up a copy of the original DOS 2.0 Master Diskette which came with your disk drive. Most people are unaware that stuck away on its mysterious recesses is the RS232 information for handling modem operations. If you are using OSS software, it is a file called "RS232.COM". Both communicators must be running through an 850 interface module. Using option E, rename it to "AUTORUN.SYS" and you are in business. Once both ends of the telephone connection have contacted each other, files are SAVED or LOADED from "R:filename". Try it, and save some transfer time.

The final little trick that Atariwriter will do for you is a variation on its duplicating text feature. Rather than using the copy function to copy within a file, you

can use it just as well to copy from file to file. Use the duplicating text sequence described on page 37 of the instruction manual. This amounts to marking the beginning and ending of the text block you want to move with a CTRL-X. At this point, however, press ESC and return to the menu. Select C to create a new file or L to load a file, depending on how you want to use your extracted block of text. If you load a file, enter the editor, position the cursor where you want the saved block of text and press OPTION D. The saved file has been residing in the copy file buffer and can be used again and again. This is especially handy if you are preparing a report which uses a special format that must be repeated. To repeat copy, just place the cursor where you want to replicate the saved block of text and press OPTION D. No need to remark and save each time. If you save a new block of text with CTRL-X, that new text will, of course, replace the previously saved block.

Atariwriter is truly a fine piece of software. Each day I wonder how I could get through my workweek without it. Thanks for some of the source material for this article goes to Clyde Pritchard of the Portland Atari club and an article in the ACE of Syracuse newsletter.





# CIRCLE DOODLE

by Lee Raabe

Responding to the various pleas for articles, I will share with you a few thoughts on playing on your ATARI. In the process I expect to have a little fun plotting a few circles using BASIC. (While I really do not have a great need for circles, it does limit the subject of doodling to something that can be squeezed into one article).

To get started, let us think about some of the properties of circles that we might play with; ie. size, color, location, empty or filled, multiple circles, etc.. Note that when thinking of size we must limit the diameter of any circle we wish to draw to that of the smallest screen dimension when the circle is centered. The diameter must also be reduced by the amount that the center of the circle is off center of the screen. Since we are only doodling it might be fun to have more than one color. For this example we will choose GRAPHICS 7 + 16 thus limiting the maximum diameter to the 96 units of the vertical full screen and getting four colors to plot with. (In actual practice something is misadjusted on the TV that I use as a monitor so I get some missed lines out near the edges but we will ignore that for now.) Note that we could get, twice the resolution (therefore rounder circles) with mode 8 but this would limit our color choice.

A circle can be thought of as being all the points in a plane (X,Y) equidistant (one radius) from the circles center. Fortunately in a time long long ago the mathematicians developed trigonometry to make it easy for us to plot circles. A circle about the center point 0,0 is defined by all the points X,Y which satisfy the relationships  $X=R\cos(A)$ ,  $Y=R\sin(A)$  where R is the radius and A is all the angles between 0 and  $2\pi$  ( $2\pi=6.28$ ) radians.

Now that we know all about circles let's write a program to plot

one. The following will give us a large circle of dots that is continuously redrawn in random colors:

```
10 GR. 7 + 16
15 W = INT(3 * RND(0) + .9)
20 COLOR W
25 C1 = 80
30 C2 = 48
35 N = 6.28
40 S = .1
45 R = 96/2
50 FOR A = 0 TO N STEP S
55 X = C1 + INT(R * COS(A))
60 Y = C2 - INT(R * SIN(A))
80 PLOT X,Y
100 NEXT A
200 GO TO 10
```

Remember that the major purpose for this exercise is to have a little fun while doodling with circles and learning a little about GRAPHICS. Save this program and start making changes to see what happens. To connect the dots, change line 80 to DRAWTO X,Y. When you get bored with this, add line 70 PLOT C1,C2 and change line 210 to GO TO 15. Later try changing line 70 to PLOT 0,0. You can experiment with changing the radius, step sizes, location of the center and multiple variables.

For some interesting doodling try drawing circles of R=10 at random locations by changing the location of the center by changing the program as follows:

```
45 R = 10
25 C1 = INT(139 + RND(0)) + 11
30 C2 = INT( 76 + RND(0)) + 11
```

This article is getting longer than I intended so I had better quit for now and let you discover the many ways to doodle with circles.

Doodle-le-do.

Sunday, June 2, 1985

by Michael Ciruolo

Chicago, IL--New products for the 8-bit Atari computers include two new games from Lucasfilm, distributed through Epyx Software.

The two games, scheduled for release this fall, are Koronis Rift and The Eidolon.

Lucasfilm team leader Noah Falstein said of his team's game, The Koronis Rift: "It's the year 2249. An ancient coalition of races once existed throughout the galaxy. They've left behind artifacts.

"You're a techno-scavenger, hunting for artifacts when you find the motherlode of finds, a weapons testing ground."

Weapons are the most sellable of items, so you drop down to the surface of Koronis to scavenge. Of course, the ancient races left behind a variety of weapons, defenses and anti-detection devices, all protected by genetically engineered Guardians.

There is one remaining Guardian base at the end of the Rift, a Grand Canyon-like chasm, which can only be destroyed with the right combination of weapons systems.

"You are armed only with puny weapons when you start," said Falstein. "But you work your way up -- acquiring detection gear, weapons, shields, anti-detection equipment. As you get better equipment, you run into tougher guardians."

Koronis Rift is a multi-strategy game, and there is no one solution to the game. "It takes the right combination of weapon systems to get to the base at the end of the Rift," said Falstein.

"As I see it, this is played the way you play a text adventure. There will be an Encyclopedia Galactica to provide information on the races leaving the systems, and you have to consider clues and strategy to reach the base at the Rift's end."

The game also works on other levels. Each weapon system is color coded, so a blue shield is the best defense for a blue laser, not so good for a purple laser, and no good for a red laser.

As one would expect from Lucasfilm, each game is breathtaking, both for game design and for programming innovation. Koronis features a cleaner version of the fractal landscape generator used in Rescue on Fractalus.

Not only are you presented with the pilot's view, control panel and overhead monitors, but Koronis also includes incredible BTIA animation produced by Jim St. Louis, who produced the introductory scene in Epyx's final version of Rescue. (Ed. Note: St. Louis was also the artist who created the famous Robot & Rocket demo graphics, used by Atari at the January CES)

The Eidolon takes you back in time, to the 19th century.

You've ventured into you uncle's dusty basement, and there it is, dials still glowing. But what is the Eidolon? According to Lucasfilm team leader Charlie Kellner, it's a magic time machine, a la H.G. Wells. The inventor left a few notes, but...

You start up the Eidolon, and find yourself in a cavern. You start running into things, and as they get more fiercesome, you get the feeling you're approaching the center. But of what?

Kellner won't say. But he did let on that the cavern, while immense, is not infinite. Indeed, it's the same cavern each time you play, and thus mappable.

"It's partly a voyage of discovery, partly a quest to get to the end," Kellner said.

Eidolon uses animation techniques never before used in home computers, according to Kellner. The characters in the game -- dragons, trolls and greps -- are produced by cel animation, the same technique used to animate Fred Flintstone and other cartoons.

Without using Player/Missile graphics, Kellner said, the animation for any one character is composed of four to six overlaid cels (from celluloid). One cel might be a leg; moved, you see a character walking, while the head is held motionless.

The Lucasfilm team's programming keeps the creatures moving logically against a three-dimensional background. "The characters are drawn in real-time, directly on the graphics screen," Kellner said.

The games are to be priced in the \$29 to \$35 range, and will be shipped in the near future. No specific ship date was given by Epyx.

What's next from Lucasfilm? The team leaders wouldn't say, but both did mention their, and George Lucas' goal: interactive movies. While that may be five to ten years away, "interactive cartoons are a good first step," according to Kellner.

Printer Buffer Routine  
by Jim Bumpas  
extracted from ACE of Eugene OR.  
June 1985

Do you have an old Atari 400 around, perhaps only serving as a spare chip set for your 800? Or maybe you couldn't sell your 600XL when you upgraded to an 800XL or an XE machine. Well, for \$40 you can buy the Printer Buffer Routine from B.L. Enterprises, Box 4282, Louisville, KY 40204.

The package comes with a cartridge, a disk, and a cable to connect two computers together through their joystick port #1. The documentation (more than 200 sectors) is on the disk, together with versions of the routine for 16k systems and those with more than 24k. I set up my 400 as the buffer, and I got 15.1k to use as a printer buffer. I printed a program listing of over 400 lines. The PBR gave me back my computer after less than 140 lines had been printed. With the 400 as the main computer, and the 800 as the buffer, I have even a larger printer buffer.

The user is advised to use Atari DOS 2.0 with this routine. I tried the copy function to printer with Smart DOS and the program did not recognize the buffer. I also tried to use it with the Writer's Tool, but as its disk has DOS XL (an OSS product) on it, and I did not create a new one with DOS 2.0, I could not get it to work. The PBR should work with cartridges such as Atariwriter, Assembler-Editor, etc.

On an XL machine, the routine locates itself into some of the unused portion of the 64k, and so creates a larger buffer than one obtains on an 800. If you've been thinking about getting a printer buffer, and you have two Ataris sitting around (or know where you can get a 400 cheap) you might find your need satisfied with Printer Buffer Routine.

The Okimate 10 Color Printer  
reprinted from The I/O Connector,  
San Diego Computer Society

People have made comments about how nice it would be to make color reproductions of their wonderful, colorful artwork. Well, the Okimate 10 would appear to fulfill their fondest wishes-maybe!

After many spectacular advertisements appearing in ANTIC and ANALOG magazines (not to mention publications appealing to the "other" 64K computer) the reviews started to appear in club newsletters. I read the reviews and talked to some actual users and found that the printer was not all that impressive. It would appear that the Okimate 10 is probably the forerunner for things to come, just as the Sinclair and VIC-20 were for the low price home computer. Yes, they preformed as advertised, but just barely.

The Okimate 10 comes with four ribbons; yellow, magenta, and cyan for color and a black ribbon for regular printing. Unfortunately, they can only be used once. This

can get rather expensive, folks. Maybe they made the printer to sell ribbons-since you are going to buy plenty!

The time required to reproduce a color picture is also quite long. The overall "letter quality" as proclaimed by the advertising is of questionable quality "letter quality" standards.

All in all, at approximately \$250 ready to go (including interface), you are going to get just what you paid for. Let's face it, any reasonable black and white printer capable of graphics is still running \$300 to \$450 without the interface. "Real" letter quality with any versatility (excluding the Atari 1027) is for the most part out of the question for the average budget-minded user! However, the Okimate 10 delivers as advertised...a bonafide 80 column color printer.

#### The Editor's Notes by David Stengel

Well, I was really pleased at the last meeting to see so many people and to see that some of them even ran for an office position. To all of you (including myself) who did get an office position, congrats. To all of you who ran but didn't make it, I thank you for running. Only one person could win...well, come to think of it, we do have TWO editors...why not TWO treasurers? Well, it's too late for that anyways. I would like to commend the old staff for all their work and dedication, and wish the new staff luck.

For all of you BASIC programmers who always wondered how to draw a circle, well relief is here. There is an article in this month's newsletter called CIRCLE DOODLE by Lee Raabe (thanks Lee) that tells you how to draw perfect circles, and other weird things. Well, look at that! I gave him special recognition. Maybe if you write an article, you too will get special recognition. Maybe I should give a prize to the first article I receive for the month. Sound good?

I'm not talking little pieces of Brach's candy either.

Well, as for adventures, it has been a little quiet. There is a program out by CodeWriter Corporation called Adventure Writer. This is a neat little (actually it's huge) program that allows you to create your very own text adventures. If you have lots of time and an adventure that you have designed all mapped out and ready to go, well then this is for you. After you design your fabulous adventure, you can do what you want with it; i.e. play it, put it up for public domain, SELL IT, etc.

Well, I hope you had an enjoyable fourth of July, and I'll see you at the next meeting. Au revoir.

#### A REVIEW OF RESCUE ON FRACTALUS by Mark Simonson

Four years ago, I was shopping around for a computer to replace my ZX80. I narrowed it down to an Apple II+ or one of the Atari computers. The Apple was proven, but expensive and the graphics did not impress me. The Atari computers cost less, but no one seemed to know much about them.

One day, I dropped into a hole-in-the-wall software dealer located in one of those mini-malls you see everywhere in the suburbs. The first thing I noticed was an Atari 400 running Star Raiders. Anyone seeing me at that moment would have observed that my jaw dropped to the floor and that my eyeballs were hovering six inches in front of their sockets. I was impressed.

That night I bought an Atari 400. The first thing I did was to play Star Raiders. This is what computers were all about! I could pilot my own spaceship, zipping around the galaxy docking with

starbases and zapping Xylons like some character in a SciFi novel. It was a masterpiece of computer graphics, with real-time 3D animation from a first person perspective.

Time passed. I bought other games, but none gave me the feeling of being immersed in another world\* the way Star Raiders did -- until now.

Rescue on Fractalus! takes up where Star Raiders left off. Instead of hunting down Xylons among the stars, you are on a search and rescue mission (a la Choplifter), flying over the mountainous terrain of a hostile, alien planet:

Fractalus.

The illusion is complete, from the orbital descent to the realistically depicted geography of the planet. The view outside the ship is breathtaking. Vast mountain ranges glide past as you cruise through the craggy canyons, searching for downed pilots. The ever present whine of engines, varying ever-so-slightly with each maneuver, adds to the realism.

The control panel displays a wide range of gauges, including a compass, wing clearance bars, thrust level and dangerous altitude indicators, artificial horizon, altimeter, targeting scope, enemy lock on indicator, energy level indicator, long range scanner, and more. Each gauge serves a useful purpose. In fact, in higher levels you must fly at night on instruments alone -- a feat which I look forward to with confidence, given the completeness of the instrumentation.

The sensation of flight is startling. The ship banks into turns; climbs and descends like the real thing, responding to the joystick like a Masseratti with wings. The shields buffet you harmlessly off the rocks if you fly too low.

Once you find a downed pilot, you land and shut off the shields. You see a pilot run towards your ship. Moments later you hear him

knock on the airlock. Open the airlock and you hear him climb into the ship. Shields on; thrusters on -- blast off! On to another downed pilot.

Like any good game, there is an adversary. The dreaded "Jaggies" have peppered the planet with unmanned anti-aircraft installations on mountain peaks. Most dangerous of all are the kamakazi flying saucers, bent on ramming your ship. The higher the level of play, the more numerous and accurate the Jaggies become. Fortunately, you are armed with Anti-Matter Bubble Torpedoes, which are very effective against their attacks.

This game is polished inside and out, replete with a heroic, ceremonial march between rounds, automatic high-score save and a slick, sixteen page instruction booklet. The special features of the Atari are exploited with skill and creativity. Attention to detail is seen everywhere. It's no surprise that the game was developed at Lucasfilms -- I doubt that anyone else could have accomplished such a feat. It's a tour de force in every respect.

If you are a Star Raiders (or Choplifter) fan, buy this game. You won't be disappointed.

And now, if you'll excuse me; there's a lot of our pilots stranded down there and a Valkrie Class Fighter waiting for me in the main hanger.

-----  
\*Actually, Wayout came pretty close. A maze, however, is not the best of all possible worlds. What about Dimension X? Nice animation, but the ships were not designed to be piloted by humans. Then there is Pole Position. Again, nice animation, but going around in circles gets dull fast and the joystick will never replace the steering wheel for driving a car.

Ed Note: A special thanks to Mark Simonson for his superbly written review. It was marvelous. Now, back to our regularly scheduled program of Ballblazer....

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CHRIS CRAWFORD  
ASSEMBLY LANGUAGE COURSE  
FOR WORLDWIDE USERS NETWORK  
LECTURE ONE - 5/28/85

#### WHY LEARN ASSEMBLY LANGUAGE?

Assembly language is the great barrier that divides the professional programmer from the amateur. It is the most powerful language available for a microcomputer.

There are four reasons for learning to program in assembly language. First, the speed of execution of assembly language is very high -- about ten times higher than BASIC on the average, perhaps a thousand times faster on certain operations.

Even ACTION, the fastest high-level language, is only about half as fast as assembly language.

Second, assembly language tends to be more compact than many languages. Again, ACTION! provides a good comparison. Code produced by ACTION! is about twice as large as equivalent assembly language.

The third reason to program in assembly language is that assembly gives you access to features of the machine that simply are not available in high-level languages. Interrupts are the most notable examples.

Finally, the most important reason for learning to program in assembly language is that it will help you to understand the machine better. And that is a very good place to begin, for you cannot learn assembly language unless you know a little bit about computers.

#### HOW COMPUTERS WORK

I am now going to describe how computers work, in very rough terms. Computers operate on a hierarchy of concepts that spans a great range, rather like the hierarchy that starts with protons



and electrons, moves through atoms, molecules, cells, people to civilizations.

A civilization is composed of protons and electrons, but to understand how it is so composed one must know a great deal about the intermediate steps. So too is a computer composed of transistors. There are four intermediate steps between the transistor and the computer.

A transistor is an electrically operated switch. We can assemble transistors into gates that will turn circuits on or off depending on the states of other circuits. There are a variety of gates reflecting the various Boolean operations: AND, OR, NOT, NAND, NOR and EOR.

Gates can be assembled into latches, decoders, and adders. A latch is the simplest memory element: it remembers one bit of information. A decoder translates a number encoded in binary form on a few wires into a selection of one of many wires. An adder will add two one-bit values, with a carry, and generate a carry of its own.

We can next broaden each of these devices into an eight-bit device by simply slinging the devices side by side. Eight one-bit latches slung side-by-side give one byte of RAM. Eight adders make an eight-bit adder.

We can thus create a RAM module by building many bytes of RAM. We access this RAM module with three buses: a data bus, an address bus, and a control bus. The data bus carries information between the central processing unit and the RAM module.

The address bus is sixteen bits wide; a decoder in the RAM module.

The address bus is sixteen bits wide; a decoder in the RAM module takes the numeric value on the address bus and decodes it to select the single byte of RAM that is indicated by the address. The control bus establishes the direction of the data flow on the

data bus and the timing of data transfer.

The central processing unit (CPU) represents the highest intellectual level of the computer. It is composed of four parts: the Arithmetic and Logic Unit (ALU), the registers, the address bus controller, and the instruction decoder. The ALU is composed of adders and gate arrays that crunch numbers. The particular device to use is selected with a decoder.

The registers are simply on-board RAM. The address bus controller is a device that puts the desired RAM address onto the address bus. The real heart of the CPU is the instruction decoder, a very complex decoder that takes the program instructions out of RAM and translates them into action. It does this by feeding the instructions (which are numbers) into decoder circuits that activate the desired gateways in the CPU.

#### PROGRAMMING A MICROPROCESSOR

Machine code is nothing more than a bunch of numbers that mean something to the CPU. It's hard to work with pure numbers, so we use a little code that makes it easier for us to understand the codes that the computer uses. This programmer-friendlier code is called assembly language. It is a direct, one-to-one translation of machine code. Here is an example of the two side by side:

Machine Code	Assembly Language
A9 05 LDA	#FINGERS
133 \$9C	STA COUNT

The code on the right may not look very readable, but you must agree, it's far more readable than the code on the left. And they both mean exactly the same thing.

Unfortunately, the computer cannot read the assembly code, only the machine code. Therefore, we need a translator program that

will translate the

easier-to-understand code on the right into the impossible-to-understand code on the left. This translator program is called an assembler.

A program that goes in the reverse direction, translating machine code to assembly, is called disassembler. It may seem like a bother to go through all the hassle of using an assembler, but it is actually much easier.

Assembly language is not only more readable than machine code, but it is also assembly-time relocatable; this means you can move it around in RAM freely before you start the assembly process. A good assembler also offers a number of extra features that make it easier to keep track of your program or modify it quickly.

#### USING AN ASSEMBLER

Due to space considerations this 1st lesson will be continued next month.

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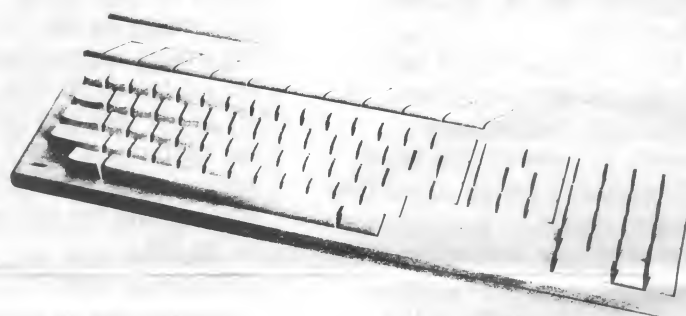
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